

6 MV photon beam induced optical properties of dyed polyvinyl alcohol/trichloroacetic acid blends

ABSTRACT

The objective of the work is to study the effect of photon on the optical properties of dyed polyvinyl alcohol-trichloroacetic acid (PVA-TCA) blends prepared through solvent casting technique at radiotherapy dose. The films were cut into 2×2 cm² and kept away from direct sunlight at room temperature until irradiation process. The films were simultaneously irradiated with a 6 MV photon beam produced by linear accelerator Siemens MXE-2. The dose exposure given was set from 50 to 400 cGy. The optical properties were measured using the UV-visible spectrophotometer Shimadzu-1800, set at a wavelength range between 200 nm and 800 nm. The absorbance spectra were obtained with the existence of three absorbance band peaks at 273 nm, 444 nm and 582 nm. Initially, all absorbance increased with increasing dose applied. The results gained indicate that the optical energy band gap, E_g is equivalent to 5.20 eV while the absorption edge is 4.96 eV. These two parameters decreased with increasing dose. It is due to the increase of structural order between the conduction band and the valence band getting narrower. This also indicates that the film is undergoing a red shift. Hence, the value of Urbach energy, ΔE obtained is 0.089 eV, which increased with increasing dose since the lattice vibration depended on the applied dose. In conclusion, the PVA/TCA blends have a good optical characteristic in terms of dose response and optical transition.

Keyword: Dyed polyvinyl alcohol-trichloroacetic acid; Optical energy band gap; Urbach energy.